Kindergarten

In this technological age, mathematics is more important than ever. When students leave school, they are more and more likely to use mathematics in their work and everyday lives — operating computer equipment, planning timelines and schedules, reading and interpreting data, comparing prices, managing personal finances, and completing other problem-solving tasks. What they learn in mathematics and how they learn it will provide an excellent preparation for a challenging and ever-changing future.

The state of Indiana has established the following mathematics standards to make clear to teachers, students, and parents what knowledge, understanding, and skills students should acquire in Kindergarten:

Standard 1 — Number Sense

Understanding the number system is the basis of mathematics. Students develop this understanding by first comparing the number of objects (such as blocks) in a given set. From comparing sets of objects, they develop the concept of counting: matching each object in a set with a counting number. Then they use counting to recognize, name, and order up to ten objects. As preparation for learning about fractions, students practice dividing sets into equal groups and shapes into equal parts.

Standard 2 — Computation

Fluency in computation is essential. As students learn about numbers, they also learn how to add and subtract them. They use objects to join sets together (for addition) and to remove objects from sets (for subtraction).

Standard 3 — Algebra and Functions

Algebra is a language of patterns, rules, and symbols. Students at this level sort and classify objects according to various rules and make simple patterns with numbers and shapes.

Standard 4 — Geometry

Students learn about geometric shapes and develop a sense of space. They identify and describe simple shapes, comparing and sorting them by such attributes as size and roundness. They learn the meaning of words, like inside and above, that relate to positions in space.

Standard 5 — Measurement

The study of measurement is essential because of its uses in many aspects of everyday life. Students begin their study of measurement by comparing objects' length, weight, temperature, etc. They use words like shorter, taller, heavier, and colder. They also learn concepts of time, such as hours, days, months, and years.

Standard 6 — Problem Solving

In a general sense, mathematics is problem solving. In all mathematics, students use problem-solving skills: they choose how to approach a problem, they explain their reasoning, and they check their results. As they develop their skills with numbers, geometry, or measurement, for example, students at this level move from simple ideas to more complex ones by taking logical steps that build a better understanding of mathematics.

As part of their instruction and assessment, students should also develop the following learning skills by Grade 12 that are woven throughout the mathematics standards:

Communication

The ability to read, write, listen, ask questions, think, and communicate about math will develop and deepen students' understanding of mathematical concepts. Students should read text, data, tables, and graphs with comprehension and understanding. Their writing should be detailed and coherent, and they should use correct mathematical vocabulary. Students should write to explain answers, justify mathematical reasoning, and describe problem-solving strategies.

Reasoning and Proof

Mathematics is developed by using known ideas and concepts to develop others. Repeated addition becomes multiplication. Multiplication of numbers less than ten can be extended to numbers less than one hundred and then to the entire number system. Knowing how to find the area of a right triangle extends to all right triangles. Extending patterns, finding even numbers, developing formulas, and proving the Pythagorean Theorem are all examples of mathematical reasoning. Students should learn to observe, generalize, make assumptions from known information, and test their assumptions.

Representation

The language of mathematics is expressed in words, symbols, formulas, equations, graphs, and data displays. The concept of one-fourth may be described as a quarter, $\frac{1}{4}$, one divided by four, 0.25, $\frac{1}{8} + \frac{1}{8}$, 25 percent, or an appropriately shaded portion of a pie graph. Higher-level mathematics involves the use of more powerful representations: exponents, logarithms, π, unknowns, statistical representation, algebraic and geometric expressions. Mathematical operations are expressed as representations: $+$, $=$, divide, square. Representations are dynamic tools for solving problems and communicating and expressing mathematical ideas and concepts.

Connections

Connecting mathematical concepts includes linking new ideas to related ideas learned previously, helping students to see mathematics as a unified body of knowledge whose concepts build upon each other. Major emphasis should be given to ideas and concepts across mathematical content areas that help students see that mathematics is a web of closely connected ideas (algebra, geometry, the entire number system). Mathematics is also the common language of many other disciplines (science, technology, finance, social science, geography) and students should learn mathematical concepts used in those disciplines. Finally, students should connect their mathematical learning to appropriate real-world contexts.

Number Sense

Students understand the relationship between numbers and quantities up to 10, and that a set* of objects has the same number in all situations regardless of the position or arrangement of the objects.

K.1.1   Match sets of objects one-to-one.

>   **Example:** Take crayons from the box and give one to each student in the group. Explain what you are doing.

K.1.2   Compare sets of up to ten objects and identify whether one set is equal to, more than, or less than another.

>   **Example:** Compare the blocks in two boxes. Tell which box contains more blocks and explain the way in which you decided on your answer.

K.1.3   Know that larger numbers describe sets with more objects in them than sets described by smaller numbers.

>   **Example:** Understand that a set of 7 apples contains more apples than a set of 3 apples.

K.1.4   Divide sets of ten or fewer objects into equal groups.

>   **Example:** Take 6 blocks and give the same number to each of 3 children.

K.1.5   Divide shapes into equal parts.

>   **Example:** Divide a piece of paper into 4 equal pieces.

K.1.6   Count, recognize, represent, name, and order a number of objects (up to 10).

>   **Example:** Count a group of seven pennies. Recognize that 7 is the number for this set.

K.1.7   Find the number that is one more than or one less than any whole number* up to 10.

>   **Example:** You have a bag of 7 apples. How many apples are in a box that holds one less than the bag of apples?

K.1.8   Use correctly the words *one/many*, *none/some/all*, *more/less*, and *most/least*.

>   **Example:** Take some of the blocks out of this box, but not all of them.

K.1.9   Record and organize information using objects and pictures.

>   **Example:** Ask some of your friends what pets they have. Use pictures of animals to show the number of pets your friends have.

>   * set: a collection of objects, numbers, etc.

>   * whole number: 0, 1, 2, 3, etc.

Computation

Students understand and describe simple additions and subtractions.

K.2.1   Model addition by joining sets of objects (for any two sets with fewer than 10 objects when joined).

        Example: Put together 3 pencils and 2 pencils. Count the total number of pencils.

K.2.2   Model subtraction by removing objects from sets (for numbers less than 10).

        Example: From a pile of 9 crayons, take away 6 crayons. Count the number of crayons left in the pile.

K.2.3   Describe addition and subtraction situations (for numbers less than 10).

        Example: In the last example, explain what operation you were using when you took away crayons from the pile.

Standard 3

Algebra and Functions

Students sort and classify objects.

K.3.1   Identify, sort, and classify objects by size, number, and other attributes. Identify objects that do not belong to a particular group.

        Example: Find the squares in a collection of shapes. Sort these squares into large ones and small ones and explain how you decided which squares went in each pile.

K.3.2   Identify, copy, and make simple patterns with numbers and shapes.

        Example: Make a pattern of squares and circles with one square, one circle, one square, one circle, etc.

Standard 4

Geometry

Students identify common objects around them and describe their geometric features and position.

K.4.1   Identify and describe common geometric objects: circle, triangle, square, rectangle, and cube.

        Example: Look for cubes and circles at home and at school.

K.4.2   Compare and sort common objects by position, shape, size, roundness, and number of vertices.

        Example: Compare the numbers of vertices of triangles, squares, and rectangles.

K.4.3   Identify and use the terms: *inside*, *outside*, *between*, *above*, and *below*.

        Example: Tell when a block is inside or outside a box.

Measurement

Students understand the concept of time and units to measure it. They understand that objects have length, capacity, weight, and temperature, and that they can compare objects using these qualities.

K.5.1   Make direct comparisons of the length, capacity, weight, and temperature of objects and recognize which object is shorter, longer, taller, lighter, heavier, warmer, cooler or holds more.

         Example: Hold two books side by side to see which is shorter. Hold one in each hand to see which is heavier.

K.5.2   Understand concepts of time: morning, afternoon, evening, today, yesterday, tomorrow, week, month, and year. Understand that clocks and calendars are tools that measure time.

         Example: Use a calendar to find the number of days in the month of your birthday.

Standard 6
Problem Solving

Students make decisions about how to set up a problem.

K.6.1   Choose the approach, materials, and strategies to use in solving problems.

         Example: Solve the problem: "There are four blocks on the table and a box of blocks that is closed. The teacher says that there are five blocks in the box. Find the number of blocks in all, without opening the box." Decide to draw a picture.

K.6.2   Use tools such as objects or drawings to model problems.

         Example: In the first example, draw a picture of the four blocks that you can see, and then draw five more blocks for the ones that you cannot see.

Students solve problems in reasonable ways and justify their reasoning.

K.6.3   Explain the reasoning used with concrete objects and pictures.

         Example: In the first example, count the number of blocks that you have drawn and write the number that represents the total.

K.6.4   Make precise calculations and check the validity of the results in the context of the problem.

         Example: In the first example, open the box of blocks and place them on the table. Count the total number of blocks on the table to see whether your drawing was correct.

NOTES